Office of History and
Historic Architecture

TONOLOWAY AQUEDUCT

CHESAPEAKE & OHIO CANAL
HISTORIC STRUCTURES REPORT
PART II

June 30, 1967

Tonoloway Aqueduct

Chesapeake & Ohio Canal National Monument

By

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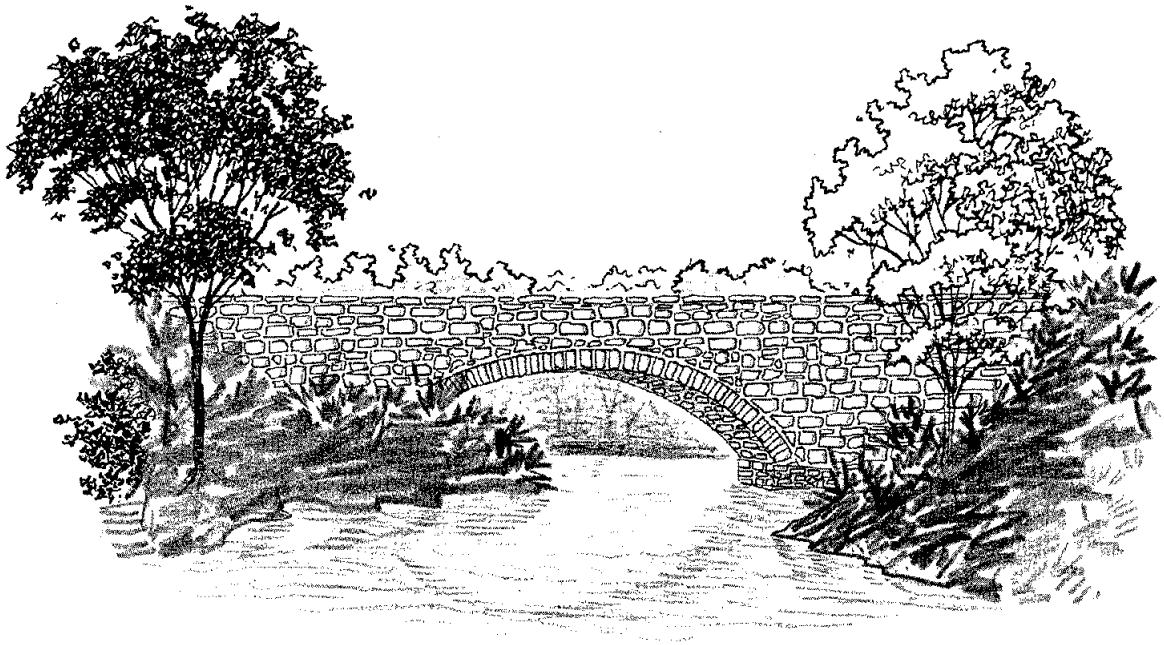

DIVISION OF HISTORY

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L I S T O F M A P S A N D I L L U S T R A T I O N S

G L O S S A R Y

Ashlar	is masonry consisting of plain blocks of stone, finely dressed to given dimensions.
Batter	is an inward inclination of the exterior face of a wall.
Berm bank	is the side of the canal opposite the one used for the towpath.
Coping	is the topmost course of masonry on a wall usually made wider than and arranged to overlap the wall and having a sloping top to throw off rainwater.
Puddle	is clay, or a mixture of clay and sand kneaded or worked, when wet, to make it impervious to water.
Rubble masonry	is water-worn or rough broken stones used in course masonry, or in filling courses of walls.
Skewback	is an inclined or splayed surface of an abutment from which an arch springs.
Soffit	is the undersurface of a lintel or arch, or the lower surface of a vault.
Spandril	is the triangular space enclosed, approximately, by the curve of an arch with a horizontal line drawn through its apex and a vertical line drawn through its springing.
Towpath side	is the canal bank on which the towpath was built.
Voussoir	is a wedge-shaped stone forming a unit of an arch.
"Works of art"	is a term used by the Board of Directors of the Chesapeake and Ohio Canal Company used in referring to masonry structures (aqueducts, dams, culverts, and locks) that were constructed along the waterway.

INTRODUCTION

Four years were required to build the aqueduct across Tonoloway Creek. 1835, the year in which bids were opened for construction of the 27 miles of waterway between Dam No. 5 and the Great Cacapon, was a trying one for the Chesapeake and Ohio Canal Company. Because of its straitened financial condition, the Canal Company had been compelled to cut its commitments. But after the passage of the Eight Million Dollar bill by the Maryland legislature in June, 1836, construction began to recover from the low level to which it had fallen in 1835. But it was a slow, expensive, and difficult task for the contractors to accumulate a large enough labor force to resume full-scale work.[1]

The slow progress of construction on the 27 miles was due to three major obstacles. Throughout the 1830's there was widespread labor unrest along the line of the canal--especially in the latter years of the decade, a period of economic crisis and social unrest throughout the nation. A second hindrance was the increasing cost of construction growing out of the inflation of the decade, the high cost of labor and engineering difficulties

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1. Walter S. Sanderlin, The Great National Project, A History of the Chesapeake and Ohio Canal (Baltimore,1946), 110-111, 115.

arising from the nature of canal building. The third obstacle was the limitation of financial resources resulting from a combination of the first two and general economic conditions throughout the Western World after 1837.[2]

While there were no labor disorders on the Tonoloway, the contractors were plagued by the increasing cost of construction. The work on the sections and "works of art" above Dam No. 5 proved more difficult, and consequently more expensive than had been anticipated. One reason was that Chief Engineer Charles Fisk, again raised the call for perfection which the former president, C. F. Mercer, had championed so persistently.[3] In 1836 the Canal Board insisted on perfection for the work above Dam No. 5, rejecting all proposals for expedients in construction:

> In the location and construction of the line of canal above dam No. 5 . . . the Board has acted on the principle that temporary works and expedients, to hasten the opening of the navigation to the [Cumberland] coal region, cannot accomplish the object for which this magnificent improvement was designed and would prove a failure alike discreditable to its projectors and managers, as well as to the community concerned; neither would the interest of the stock-

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2. Ibid., 115-116.

3. Fisk to President & Directors, March 30, 1835 (Ltrs. Recd., C & O Canal Co.). All manuscript source materials referred to in this report are deposited in the Department of the Interior files at the National Archives and are designated Record Group No. 75

> holders have been consulted by a plan of operations looking only to saving in cost and time. False and imperfect construction and location would necessarily induce frequent costly repairs, amounting eventually to more than the first cost of perfect work . . . .[4]

More than anything else, the contractors for the Tonoloway Aqueduct were harassed by the increased cost of labor and supplies. With the resumption of large-scale operations the shortage of workers became acute. To relieve this situation, A. B. MacFarland, Superintendent of Masonry, was sent to Philadelphia and New York to recruit additional hands. Despite his efforts, the level of wages on the canal rose from $8 to $10 per month to $1.18 3/4 and $1.20 a day.[5]

The failure of the Company to secure adequate financial resources to support its work likewise slowed the work on the Tonoloway Aqueduct. The assistance provided by Maryland was usually late, always the minimum possible, and invariably in the form of state bonds which had to be marketed to produce the aid granted. Pending sale of the bonds, the Company's current funds at times became exhausted, and the directors had to resort to bank loans to meet the expenses of construction.[6]

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4. Ninth Annual Report (1837), 6-7.

5. Sanderlin, The Great National Project, 125-126.

6. Ibid., 128.

HISTORIC STRUCTURES REPORT, PART II, TONOLOWAY AQUEDUCT

Chapter I

Brown and Small Build an Aqueduct

Before proposals for the construction of the aqueduct across Tonoloway Creek, or Aqueduct No. 7 as it was designated, could be invited, a survey would have to be made, land for the right-of-way purchased, and plans and specifications for the structure prepared. According to the survey undertaken in 1834 by an Engineer, Alfred Cruger, it would cost $663,676 for the construction of the 27 miles of canal between Dam No. 5 and the Cacapon. Engineer Fisk revised this figure in June, 1835, on the basis of work actually done, raising it to $1,022,534.[1]

Land on the east side of Tonoloway Creek from which the Company would have to purchase a right-of-way was owned by Joseph Yates, while that on the west bank belonged to James H. Bowles. Yates on March 4, 1834, had signed an option to allow the Chesapeake and Ohio Canal for $100 per acre "to construct, use, and occupy the land required for their canal, passing across his land." Moreover, he would sell to the Company all his right and title "to the said land upon the payment of the above sum per acre, measuring the arable land, required for the canal and lying between

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1. Eighth Annual Report (1836), 3-4; Sanderlin, The Great National Project, 107.

the canal and river," provided the ditch was constructed on the margin of the Potomac and below his house.[2]

Seventeen months later, Yates on August 5, 1835, sold to the Company for $2,125, 22 acres and 131 perches of land. The tract conveyed was to begin on the north side of the canal on the line dividing the property owned by Yates and David Barritt; thence westward along the north boundary of the canal to a stone set on the east bank of Tonoloway Creek; thence by low water mark to the mouth of the stream; thence eastward 4,400 feet with the low water mark of the Potomac to the line separating the property of Yates and Barritt; thence with this line north 4 degrees east 260 feet to the point of beginning.

The Company agreed to "make, establish and maintain" on the land acquired from Yates ditches and drains so that "no leakage from their canal may at any time overflow" any of Yates' property exterior to the tract conveyed. In addition, Yates was to have the privilege of connecting his small ponds by spouts or drains with the canal for the purpose of watering his livestock.

The road leading from the National Turnpike through Yates' land to the Potomac River and passing his house was to be kept open for the contractors engaged on the canal, until such time

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2. Option from Yates, March 4, 1834 (File 34, Land Records, C & O Canal Co.)

as water was let into the ditch. A second road, 25 feet in width, along the boundary separating Yates' and Barritt's property was to remain open under the same conditions.[3]

Having signed an option to permit passage of the canal over their land, James H. and Martha Bowles on July 18, 1835, sold to the Canal Company for $2,400 two lots in Hancock and a tract bounding the Potomac River. This tract extended eastward from the town lots to Tonoloway Creek, and contained 19 acres and 77 rods. In addition, the Bowleses granted to canal officers, contractors, and laborers free use of their property and access to the proposed aqueduct over Tonoloway Creek, along with the right of deposit thereon for timber, stone, and other building material for the next 18 months.[4]

The tract conveyed began on the north side of the canal on the west bank of Tonoloway Creek, at the low water mark; thence north 79 degrees west 268 feet to a stone corner; thence north 70 1/4 degrees west 292 feet to a stone corner; thence north 61 1/2 degrees west 377 feet to a stone corner; thence north 66 3/4 degrees west 175 feet to a stone corner; thence north

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3. Deed, Yates to C & O Canal Co., Aug. 5, 1835 (File 34, Land Records, C & O Canal Co.).

4. Deed, James H. and Martha Bowles to C & O Canal Co., July 18, 1835 (Land Records, C & O Canal Co.).

72 degrees west 833 feet to a stone corner; thence north 77 degrees west 200 feet to a stone corner; thence north 82 degrees west 890 feet to a stone corner; thence north 79 3/4 degrees west 113 feet to a stone corner; thence north 77 1/2 degrees west 1,500 feet to a stone corner on the land dividing Bowles' and Rowland's land; thence south 65 degrees west 110 feet to the middle of a deep ravine dividing Bowles' and Rowland's property; thence by the ravine 66 feet to the low water mark of the Potomac; thence by said low water mark easterly 4,750 feet to the mouth of Tonoloway Creek; thence north by the low water mark of the west bank of the stream 120 feet to the beginning.[5]

In the spring of 1835 Chief Engineer Fisk of the Chesapeake and Ohio Canal was asked by the Board of Directors to prepare a detailed study of the line of the canal from Dam No. 5 to the mouth of the Cacapon that was to be let out for bids. He was to review Cruger's survey and the specifications for locks, culverts, and aqueducts to see what, if any, economies could be effected. When he took up the aqueducts, two of which were slated to be built on this section, Fisk reported:

> It is proposed to have all the work of rubble masonry except the sheeting, which must necessarily be cut; and

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5. Ibid.

> the water table coping which I propose should be scrabbled masonry. The rubble masonry is as good as cut work, where we propose to use it, as it is not subject to any sort of injury.
>
> And as to the scrabbled work the same remark may be made on the subject, as those used when speaking of the locks. Particular care has been taken in planning of the back of the abutments, and of the wings, so that it shall be impossible that any difficulty shall occur by breaches or otherwise.[6]

Turning to a request by the Board of Directors that he study and report on the expediency of substituting wood for stone in the locks and aqueducts on this portion of the canal, Fisk observed that between Dam No. 5 and the mouth of the Cacapon there were to be 12 locks and two aqueducts. Contrary to reports reaching the Board, Fisk had found what he described as "good limestone quarrys" within short hauling distances of most of the projected locks. At Licking Creek there was a limestone quarry within three-quarters of a mile of the place where the aqueduct was to be built. Two locks (Nos. 51 and 52) and one aqueduct were to be constructed at the crossing of the Great Tonoloway. Stone for these "works of art" could be secured from a "good limestone quarry up the little Tonoloway at no unreasonable distance, 2 miles, the greater part of the way upon the Cumberland Road."

When all factors were taken into consideration, Fisk was of

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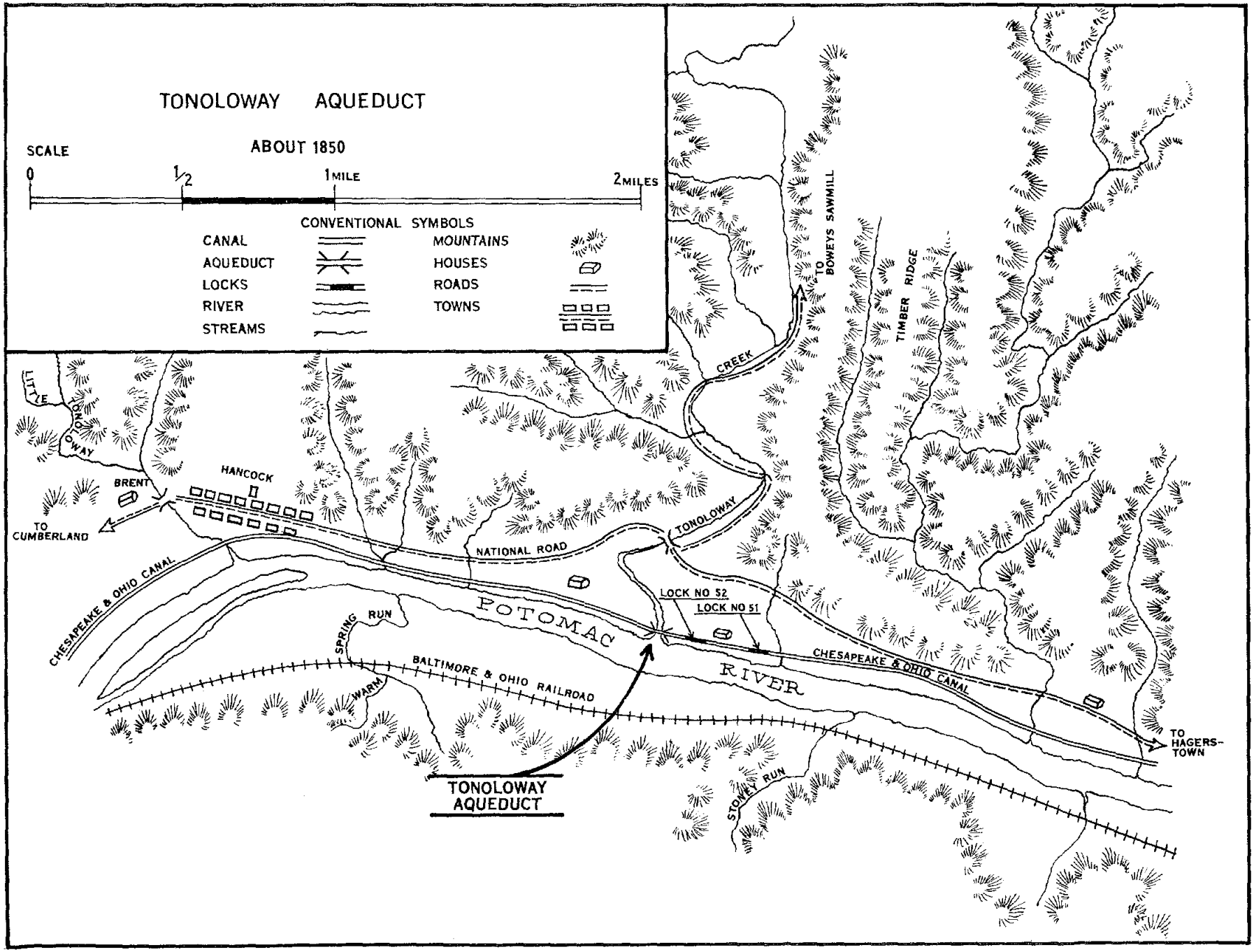
6. Fisk to Board of Directors, June 10, 1835 (Ltrs. Recd., C & O Canal Co.).


TONOLOWAY AQUEDUCT
ABOUT 1850
SCALE
0
1/2
1 MILE
2 MILES
CONVENTIONAL SYMBOLS
CANAL
AQUEDUCT
LOCKS
RIVER
STREAMS
MOUNTAINS
HOUSES
ROADS
TOWNS
TO BOWEYS SAWMILL
TIMBER RIDGE
CREEK
LITTLE TONOLOWAY
BRENT
HANCOCK
TO CUMBERLAND
CHESAPEAKE & OHIO CANAL
NATIONAL ROAD
TONOLOWAY
LOCK NO 52
LOCK NO 51
SPRING RUN
POTOMAC RIVER
BALTIMORE & OHIO RAILROAD
WARM
CHESAPEAKE & OHIO CANAL
TO HAGERS-TOWN
STONEY RUN
TONOLOWAY AQUEDUCT

the opinion that there was no section of the canal, where stone could be secured at less cost. If the Board's object had been to "lessen the disadvantages resulting from a scarcity of stone," it would be unnecessary to pursue the subject further. If, however, the object was economy, it would be necessary for him to draft figures as to what savings would accrue from the temporary substitution of wood for stone in the locks and aqueducts as some had suggested.[7]

The Board, as previously noted, vetoed the suggestion that wood be substituted for stone in the "works of art" on the 27-mile section.

At a meeting held on June 17, attended by the President and Board of Directors of the Canal Company, it was directed that the clerk advertise for proposals for the "construction of such Sections, Locks, Aqueducts, Culverts and Dams, as may be reported by Chief Engineer Fisk, to be ready for contract between Dam No. 5 and the Cacapon." The time limit for completion of the masonry works on this portion of the canal was to be October 1, 1836, and for the other works, November 1.

Three days later, on the 20th, a notice appeared in the National Intelligencer announcing that proposals would be received at the Canal Company's Washington office:

> till Monday the 29th inst., at 10 o'clock A. M. for the construction of twenty of the most difficult sections of the Canal, upon the line located between Dam No. 5

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7. Ibid.

> and the Great Cacapon, on the Potomac river; for an Aqueduct across Licking Creek, and one across the Great Tonoloway; for nine lift Locks and one Guard Lock, and for all the Culverts necessary upon the above line; and also for a Dam across the river Potomac at the mouth of the Cacapon, or at some suitable point above that place.
>
> Specifications will be furnished, and further information given at this office, after Wednesday, the 24th.
>
> In receiving the proposals the Board reserves the right of exercising a discretion in selecting such as may be approved.[8]

A number of proposals had been received by the time the Board of Directors held its July 1 meeting. Before they adjourned for the evening, the bids had been abstracted. Two days later, on the 3rd, the Board, having determined that Robert Brown of Baltimore had submitted the low bid, awarded to him the contract for the construction of Aqueduct No. 7 across Great Tonoloway Creek.[9]

Brown proposed to charge the Company the following prices:

cut stone	$19,87 1/2 per perch
rubble work	$ 4,87 1/2 per perch

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8. Washington National Intelligencer, June 20, 1835; Proceedings of the President & Board of Directors, June 17, 1835, Book D, 341.

9. Proceedings of the President & Board of Directors, July 1, 1835, Book D, 356-357. A thorough search of the C & O Company files has failed to turn up detailed plans and specifications

The preparation of rock skewback for the eastern abutment and of the foundations on that side of the stream, along with the foundations, cofferdams, and bailings for the abutment on the west bank were to be done at a price to be estimated by Chief Engineer Fisk before Brown signed the contract. A similar stipulation was attached to all embankment and puddle ordered.

Before the contract was signed, Fisk established the prices that would be paid Brown for:

Sand and cement	$1.10 per perch
Laying.	1.37 1/2 per perch
Centers	2.00 per perch
Sheeting.	1.65 per superficial foot, measuring soffit and ends of wing
Ashlar.	87 1/2 cents per running foot
Coping.	50 cents per superficial foot, measuring everything that shows
Skewback (course)	$12 per perch[10]

On August 24 Fisk notified the Board of Directors that among the contractors who had complied with the stipulation in their

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for Aqueduct No. 7. The only plans bearing on this "work of art" found were those for the "Entrance Walls of Aqueducts No. 6 & 7," a copy of which accompanies this report.

10. Prices for Aqueduct No. 7, undated memorandum (files, Chief Engineer, C & O Canal).

contract to commence work within 30 days was Brown. Where one contractor, such as Brown, had several projects, Fisk had not insisted upon a beginning being made on each. (Brown also held the contracts for Locks Nos. 51 and 52, which were located a short distance below Aqueduct No. 7.)[11]

It was late September before Brown and his partner, Andrew Small, had their men at work on Aqueduct No. 7. According to their agreement, Brown was to provide the capital for the venture, while Small would oversee construction.[12]

Reports reaching Commissioner George Bender's Hancock headquarters during the autumn of 1835, indicated that Small and his people were making headway. On December 7 Brown and Small were paid $2,163.50 on the November estimates of work done on Aqueduct No. 7, and Locks Nos. 51 and 52.[13] (See Appendix A for list of payments made by the Company to the Contractors for construction of Aqueduct No. 7.)

Cement for many of the "works of art" on the 27-mile section came from Captain Hook's mill, located on the south bank of the Potomac, across the river from Hancock. The contractors, at times,

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11. Fisk to Board of Directors, Aug. 24, 1835 (Ltrs. Recd., C & O Canal Co.).

12. Ledger Book A, C & O Canal Co.

13. Ibid.

were harassed by cement shortages. In mid-March, 1836, Hook's mill for some undisclosed reason shut down. It was the last week of March before burning was resumed, and Hook was able to notify the contractors that he was ready to begin grinding.[14]

About this time, Ellwood Morris, the assistant engineer with the Company responsible for overseeing construction of the canal between Licking Creek and Oldtown, called on his assistant, Samuel Williams, who was project engineer on the Tonoloway. After examining the aqueduct, Morris explained to his subordinate the "manner" in which he wished the centers removed. As construction was lagging, it would be some time "before the necessary preparations could be made for their removal"[15]

1836 was a year of inflation. Wages and prices rose rapidly. Builders who had secured contracts to erect "works of art" on the canal between Dam No. 5 and the Cacapon suffered. Many of the contractors involved registered complaints with the Company, while some abandoned their projects.

To cope with this situation and afford a measure of relief to the contractors, President George C. Washington asked Chief Engineer Fisk to make a study and submit a report as to what

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14. Williams to Fisk, March 26, 1836 (Ltrs. Recd., Chief Engineer, C & O Canal Co.).

15. Ibid.

percentages on the contract price of work taken prior to October 1, 1835, would enable the contractors to "complete their several works by September 1, 1837."

Fisk in his report filed on August 22 recommended that "relief be granted to the persons herein named in the manner set forth." To Robert Brown it was recommended the Company should pay all but 10 percent of the money due, whenever the project engineer certified that Small had a sufficient force on the job to complete the aqueduct and locks by the designated date. Thereafter, the Company would retain only 10 percent, provided the contractor continued to make satisfactory progress. After the locks and aqueduct were accepted by the Company, Brown would be paid $2,000 over and above his contract price.

If the Board of Directors agreed to grant the contractors along this section of the canal the proposed relief, Fisk felt certain that "we may fill the Canal to the Cacapon by the last of next year." If, however, no relief were granted, he feared that the projects would be abandoned, and the mechanics would leave the line. The contracts would then have to be relet at a higher figure.[16]

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16. Fisk to Board of Directors, August 22, 1836 (Ltrs, Recd., C & O Canal Co.).

Commissioner Bender believed the plan proposed by Fisk would afford necessary relief to the contractors, while "the inducement to prosecute their works to completion would be equally as great as it would have been under the conditions of their contracts if prices" had not skyrocketed. Moreover, the 5 to 10 percent which Fisk proposed the Company retain, together with the increased price for the projects, would be made contingent on completion.[17]

Under the Fisk plan, Brown would be entitled to $260 on the contract for Aqueduct No. 7. This figure was determined by calculating the relationship that work done between August 1, 1835 and January 1, 1836, bore to work remaining to be completed on August 1.[18]

Brown on September 9 was paid $1,114.50 for work done on Aqueduct No. 7 and Locks Nos. 51 and 52 since the August 4 estimate.[19]

On the 20th Brown complained to Fisk that he had received a copy of a letter sent to his partner, Small, by Commissioner Bender explaining the scheme to pay $2,000 over and above the contract price, provided Aqueduct No. 7 and Locks Nos. 51 and 52 were completed by a designated date. Brown believed this was a good idea, but, he inquired, "Why differentiate between contractors?" Brown had

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17. Bender to President & Board of Directors, August 23, 1836 (Ltrs. Recd, C & O Canal Co.).

18. Fisk to Bender, August 22, 1836 (Ltrs. Recd, C & O Canal Co.).

19. Ledger Book A, C & O Canal Co.

learned that several of the contractors, in accordance with the Fisk formula, were scheduled to be paid more than he and Small.

Since beginning work on the canal, Brown complained, "his health had been broken, so he could not personally observe his contracts." Now to add to his difficulties, it had been "proposed to cutt [sic] me off with less than my neighbors above and below."

It appeared to Brown that the Company proposed to penalize contractors "who had progressed faster and paid out our own money freely." Moreover, it should be apparent that "our quarry has [been] worked very hard, and at a great expense and with a view to forward the work as fast as possible." Small had sent his people out four miles for a large quantity of stone, which had added to his costs.

To add to his embarrassment, Bender had explained to Brown that when Small was half finished with the contract, the Company was to pay 5 percent of the money held in reserve. If reports he had been receiving from Small were correct, the contract should have reached that point. Another 5 percent was to be forthcoming when the arch of the aqueduct was turned. Unless the Company paid what had been promised, Brown would be obliged to have Small suspend work until additional capital could be borrowed. Despite these problems, Brown promised that he would see that work on Aqueduct No. 7 and Lock No. 52 was pushed, "whether you give us any allowance" to compensate for the rise in wages. No more work,

however, would be done on Lock No. 51 till the Company agreed to increase the money due on the contract.[20]

Fisk on December 1, acting under the assumption that relief proposed in August was insufficient, recommended larger advances to the badgered contractors. These advances, which he proposed were to be applicable to the "work done as well as that to be done." Under this new formula, Brown and Small would be entitled to $6.87 1/2 for the rubble masonry instead of $4.87 1/2. Based on this formula the contractors would be paid $4,820 (2,410 perches of rubble masonry) on the estimates for Aqueduct No. 7.[21]

Brown and Small on December 28 applied to the Board for additional relief. When Brown had placed his bids, he had felt the price was fair, and he "had no doubt but we would be able to finish it without giving you any trouble." But in the months since August, 1835, laborers' wages had risen from 75¢ to $1.12 1/2 per day. At the same time, the wages of masons and stone cutters, who when proposals had been opened were being paid from $1.50 to $1.75, rose to $2 per day. By the summer of 1836 these artisans were drawing from $2.25 to $2.50 for a day's work.

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20. Brown to Fisk, Sept. 21, 1836 (Ltrs. Recd., Chief Engineer, C & O Canal Co.).

21. Fisk to Board of Directors, Dec. 1, 1836 (Ltrs. Recd., C & O Canal Co.).

The contractors trusted the Board was aware "that their bids had been pared to the bone," and had they foreseen the "change that was to take place in the rise of men's wages, provisions, iron, steel, and every article used," it would have been reflected in their proposals. Now, they were merely asking "for a Price for the work equal to the rise of everything else."

"We have," the contractors admitted, not done as much work on Aqueduct No. 7, and Locks Nos. 51 and 52 as the Board desired, but "we have done all we were able to do and we hope to the satisfaction of the Hon. President, Directors, and Engineer." It was now for the Board of Directors to say whether they should go on or "sink under the Pressure of the times." While the Board had been thoughtful enough to offer the contractors an additional $2,000 if they completed Aqueduct No. 7, and Locks Nos. 51 and 52 by November 1, 1837, that sum would not be forthcoming till the projects were finished, while at the same time 1/5 of each estimate was to be retained by the Company. Such a proposition, however, would give them no current relief, as they had gone as far as the percentages received on previous estimates and their own resources would permit. As they had stretched their credit to the limit, the contractors would have to have an immediate advance of $1,000 to enable them to pay off some of their creditors, or they would be compelled to abandon the contracts.

When the Board discussed the contractors' appeal at its February, 1837, meeting, they realized that it would be impossible to get any one to undertake the projects for less, so they ordered $1,000 advanced out of the retained sum.[22]

Additional relief was granted Brown and Small on February 9, when Chief Engineer Fisk reported that they were entitled to $260 under the Board's order of August 22.[23]

Superintendent of Masonry A. R. MacFarland in mid-November, 1836, had cautioned Fisk that Small "is coming out as I predicted." Since Fisk's departure from the Hancock area, Small had not got out over five or six pieces of sheeting. When MacFarland had complained about his progress, Small protested that he was short-handed. MacFarland knew better. Small's conduct, he charged, is "infamous" and such as to cause fears that he planned "to bring upon us the disgrace of loosing [sic] the arch."[24]

John Rhind, the assistant superintendent of masonry for the Company at Licking Creek, served notice on MacFarland on

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22. Brown and Small to Board of Directors, Dec. 28, 1836 (Ltrs. Recd, C & O Canal Co.).

23. Fisk to Board of Directors, Feb. 9, 1837 (Ltrs. Recd., C & O Canal Co.).

24. MacFarland to Fisk, Nov. 15, 1836 (Ltrs. Recd., Chief Engineer, C & O Canal Co.)

February 23, 1837, that he was resigning his position, as soon as the Company could send up a replacement. On doing so, he would take employment with the firm of "Brown & Small in their work at and near Tonoloway."[25]

Commissioner Bender on the 22nd wrote President Washington that he had reason to fear that there would be a shortage of "hands, particularly masons and stone cutters," on the canal during the year. Each contractor seemed afraid that if he exerted himself to hire artisans and laborers, the others would drag their feet and reap the benefits of his exertions. Would it not be wise, Bender inquired, to dispatch MacFarland to Philadelphia, New York, and New England to recruit artisans by holding out such inducements as the Board might authorize?[26]

The Board liked Bender's suggestion, and MacFarland left Hancock for New York on March 20.[27]

On May 24 Brown advised Fisk that he had called on Small and had urged him to turn out sufficient hands to "insure the completion of the work within the time stipulated." The Company,

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25. MacFarland to Fisk, Feb. 23, 1837 (Ltrs. Recd.,Chief Engineer, C & O Canal Co.). George Ellis was named as Rhind's replacement at Licking Creek.

26. Bender to Washington, Feb. 22, 1837 (Ltrs. Recd., C & O Canal Co.).

27. Bender to Ingle, March 20, 1837 (Ltrs. Recd., C & O Canal Co.).

Brown admitted, had been very "liberal towards the contractors," so it was their duty to "make every effort within their power to have the work done as soon as possible."

Wages would have to be increased, if Brown were to recruit any more laborers in the District of Columbia. If wages were raised, he believed he could reinforce Small with "any number of masons and stone cutters."

Brown had just learned that Small had subcontracted Lock No. 51 to a man recommended by Fisk. This news was welcomed, because it was anticipated that Small could now devote his energies and resources to completing Aqueduct No. 7 and Lock No. 52. Brown trusted that Fisk would keep him posted as to Small's progress, and at the same time notify him whether he should continue to send up masons and stone cutters. Two stone cutters, whom he had recently employed, had returned from Hancock with word that none of the contractors (Small, Childs, or Cannon) would give them work.[28]

In mid-June, Small explained to Morris that he had been directed by Fisk to increase his force. Before the discussion had ended, Small started complaining about the price he was to be paid for excavating "the flume wall of Lock No. 52 & the preparations under the river bank."

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28. Brown to Fisk, May 24, 1837 (Ltrs. Recd., Chief Engineer, C & O Canal Co.).

"If those little matters" were all that kept him from increasing his force, Morris retorted, Chief Engineer Fisk would permit the price per cubic yard to be increased.

When they parted, Small started for Hancock to hire additional hands. He planned to be back on the canal by June 28.

Upon relaying this information to Fisk, Morris made it a matter of record that as yet he had "seen nothing to shake my belief of the necessity of taking" the contract for Lock No. 52 away from Small.[29]

The stockholders on June 12 had been notified by Fisk:

> Between dam No. 5 and Cacapon, besides numerous culverts of from four to twelve feet span, and one over Little Tonoloway of forty feet span, there are ten locks of eight feet lift each, including the guardlock at dam No. 6, and two aqueducts crossing Licking Creek and Great Tonoloway. The first is an arch of ninety feet span, the second of sixty-five feet between the abutments--the arches of both being turned. The material on all are the most approved kind, and the workmanship cannot be surpassed.[30]

A severe drought gripped the upper Potomac Valley during the early summer; the river stage at Hancock fell to a point where it was impossible to keep Hook's mill running more than 12 hours out of every 24. To supply with cement the contractors along the canal

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29. Morris to Fisk, June 18, 1837 (Ltrs. Recd., Chief Engineer, C & O Canal Co.).

30. Proceedings of the Stockholders, Book B, p. 95.

above and below Hancock plans were made to haul from Boteler's and Shafer's mills.[31]

Fisk on August 9 announced that the Board had finally declared "Mr. Brown's contracts for Locks Nos. 51 and 52 abandoned." It might be wise, however, he observed to "make an arrangement" with Brown for Lock No. 52, should it be determined to be of benefit to the Company to allow Small to complete it.

On the following day, the 10th, Secretary John P. Ingle declared Brown's contracts abandoned. According to Project Engineer Morris, Brown had refused to increase his force as directed. As Brown resided in the District of Columbia, Ingle would notify him personally of the Board's action.[32]

Robert McCoy had previously expressed an interest in completing Locks Nos. 51 and 52. But before quoting a price to the Board, he determined to make an on the spot investigation of the situation. Early in August, McCoy visited the "Locks and quarry at Captain Harts." An examination satisfied McCoy that the stone was of good quality. Small, who was hauling stone from the quarry to Aqueduct No. 7, told McCoy that he would need stone to complete the project from the quarry recently opened by Joy. Indeed, Small gave McCoy to understand that he could expect no favors from him. By terms

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31. MacFarland to Fisk, July 9, 1837 (Ltrs. Recd., C & O Canal Co.).

32. Ingle to Bender, Aug. 10, 1837 (Ltrs. Recd., C & O Canal Co.).

of his agreements with Hart and Joy, Small had first call on the best quarries in the vicinity. A new source of stone would have to be located by persons interested in taking over the contracts for Lock Nos. 51 and 52. Since this would cost a considerable sum, McCoy concluded that "the work cannot be done for less than $9.00 a perch."

An examination of the "stone work on the canal" from Dam No. 5 to the Cacapon satisfied McCoy that the locks, aqueducts, and culverts on this portion "are superior to any other works of the same kind in the United States."[33]

At the end of August, Ingle notified Bender that the Board had accepted the proposal of Small to take over Brown's contract, so far as it related to Lock No. 52. As for Lock No. 51, Small had agreed to authorize the final estimate to be made for materials furnished and work done, with four-fifths of that sum to be paid to the contractor, and the remainder to be forfeited to the Company.[34]

MacFarland on September 10 allowed John Cameron to borrow the patterns prepared for the ring stones in Aqueduct No. 7, 29

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33. McCoy to Fisk, Aug. 8, 1837 (Ltrs. Recd., Chief Engineer, C & O Canal Co.).

34. Ingle to President and Board of Directors, Aug. 29, 1837 (Ltrs. Recd., C & O Canal Co.).

in all.[35]

On the 29th MacFarland spent the day on Tonoloway Creek, and what he saw he didn't like. Writing to Morris, he complained, "the masonry at Aqueduct No. 7 is at a stand more than half the time and very little prospect for the better," because of a shortage of cement.

In hopes of discovering a solution to this situation, MacFarland recommended that Fisk visit the "cement Establishment at Shepherdstown" on his way up from Washington. During the past several weeks, several shipments of "very bad cement" had been received from Boteler's mill. MacFarland suspected this had been caused by "an injudicious selection at the quarries."[36]

On November 22 Commissioner Bender forwarded to the President and Board of Directors a contract he had entered into with William Story on the 13th for the completion of Lock No. 51. When Brown and Small had ceased work on the lock, Bender on August 14 had reached an understanding with McCoy. Before the agreement could be reduced to writing, McCoy on October 18 had informed Bender that "he would not be able to go on with it so as to complete it in May 1838 and that Story had quarries opened, and other

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35. MacFarland to Bender, Sept. 10, 1837 (Ltrs. Recd., C & O Canal Co.).

36. MacFarland to Fisk, Sept. 29, 1837(Ltrs. Recd., Chief Engineer, C & O Canal Co.).

arrangements which it would take him. . .a long time to equal." Story was agreeable to undertaking the completion of Lock No. 51 for the price McCoy had quoted.[37]

Secretary Ingle on December 8 was able to notify Bender that the Board had confirmed the contract made with Story for completion of Lock No. 51.[38]

On January 1, 1838, Morris notified Fisk that up till December 15, 1837, Brown and Small had done $39,234.72 worth of work on Aqueduct No. 7. According to estimates just submitted by Williams, the contractors were entitled to $3,699.35 for work done in November.[39]

Fisk on the 27th wrote Morris that the Board had agreed to contract with Brown and Small for the towpath mortared wall between Aqueduct No. 7 and Lock No. 52. [40]

Morris on visiting the site on April 10 discovered that Small had withdrawn his men from Lock No. 52. On doing so, he had announced that "he could not stand the Inspection of the Engineer." This inspection, Morris had pointed out, was required by contract, and the inspecting officer had never demanded that Small do anything that the "contract had not already bound Robert Brown to do."

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37. Bender to Board of Directors, Nov. 22, 1837 (Ltrs. Recd., C & O Canal Co.).

38. Ingle to Bender, Dec. 8, 1837 (Ltrs. Recd., C & O Canal Co.).

39. Morris to Fisk, Jan. 1, 1838 (Ltrs. Recd., Chief Engineer).

40. Fisk to Morris, Jan. 27, 1838 (Ltrs. Recd., C & O Canal Co.).

Many of the Ashlar for the lock had been measured by Ellis for running estimates as much as two years before. Morris had never given the stones listed as measured for monthly estimates more than a cursory examination, because he did not believe he was obligated to accept them until they were "built into the Lock." If any of the Ashlar were "deficient in angles, slack to the square, or not cut within 1/2 inch of what would be necessary to make a clean cut stone," he was in his right in having them condemned.

Consequently, when Morris had made his inspection of Lock No. 52, he had ordered all Ashlar not conforming to specifications excluded. In carrying out his duties, Morris had not believed it necessary to inquire whether the stone "viewed as objectionable" by him had or had not been previously accepted by Ellis, or if it had been laid down in Williams' presence.

Small, however, argued that Ellis, as sub-agent of masonry, was both the primary and final inspector, while Morris' business was to provide plans, give levels, and calculate the estimates.

Since no time should be lost at the Great Tonoloway, and he doubted that even "with the utmost vigor we can prepare that work for the water before August 1," Morris recommended that the contract for Lock No. 52 be offered to Story at the same price he had bid for Lock No. 51. Morris believed that Story had both the skill and energy to accomplish the job. At the moment, Lock No. 52 was

about four feet high, while Lock No. 51 was seven feet high "all around & has progressed & is progressing under the same" guidelines as the inspecting officer had employed on Lock No. 52.

Inasmuch as the wall connecting Aqueduct No. 7 and Lock No. 52 should be "raised with the lock & bound in with it," it was questionable whether "it ought not to go with the lock."[41]

Fisk on July 20 notified Morris that Small would be required to build the dry walls adjoining Lock No. 52. These walls had been included in the contract for the lock, and only by abandoning that contract could Brown and Small be released from erecting them.

In accordance with Morris' suggestion, Fisk had already reported the agreement to build the mortared walls between Aqueduct No. 7 and the lock abandoned. Consequently, the Board would raise no objection to Story undertaking that project, provided it was understood that he would use stone previously estimated to Small.[42]

Morris on July 6 wrote Fisk that in early March he had made an estimate for Small on the entrance walls to Aqueduct No. 7. The estimate was for 250-perch of stone for which Small was to be paid $625. Since then he had learned that Brown and Small had collected that amount from the Company. Morris, however, feared

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41. Morris to Fisk, April 10, 1838 (Ltrs. Recd., Chief Engineer).

42. Fisk to Morris, July 20, 1838 (Ltrs. Recd., Morris).

that the contractors would use the 250-perch in the dry walls of Lock No. 52, replacing them with stone of an "inferior quality," because Small was known to have on hand 50-perch of rubble, in addition to the 250-perch, and he had suspended quarrying and hauling. If Story were now the contractor for the entrance walls, as well as the lock, the 250-perch should be placed in his possession.[43]

Three days later, on the 9th, Morris estimated that the entrance walls at the western end of Aqueduct No. 7 contained 282-perch of masonry.[44] Small, having made no "movement" toward preparing for the "dry walling and none whatever toward building the eastern connecting wall" of the aqueduct, Morris told Story to construct the wall at the price proposed to Fisk.[45]

Hearing that the Board had declared the contract for the connecting walls abandoned, Morris trusted that he had not acted in haste in negotiating with Story. So on the 19th, he explained to Fisk that as he was certain Small did not propose "to execute the work," he had directed Story to "Build the wall," using the 250-perch of stone previously credited to Small.[46]

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43. Morris to Fisk, July 6, 1838 (Ltrs. Recd., Chief Engineer).

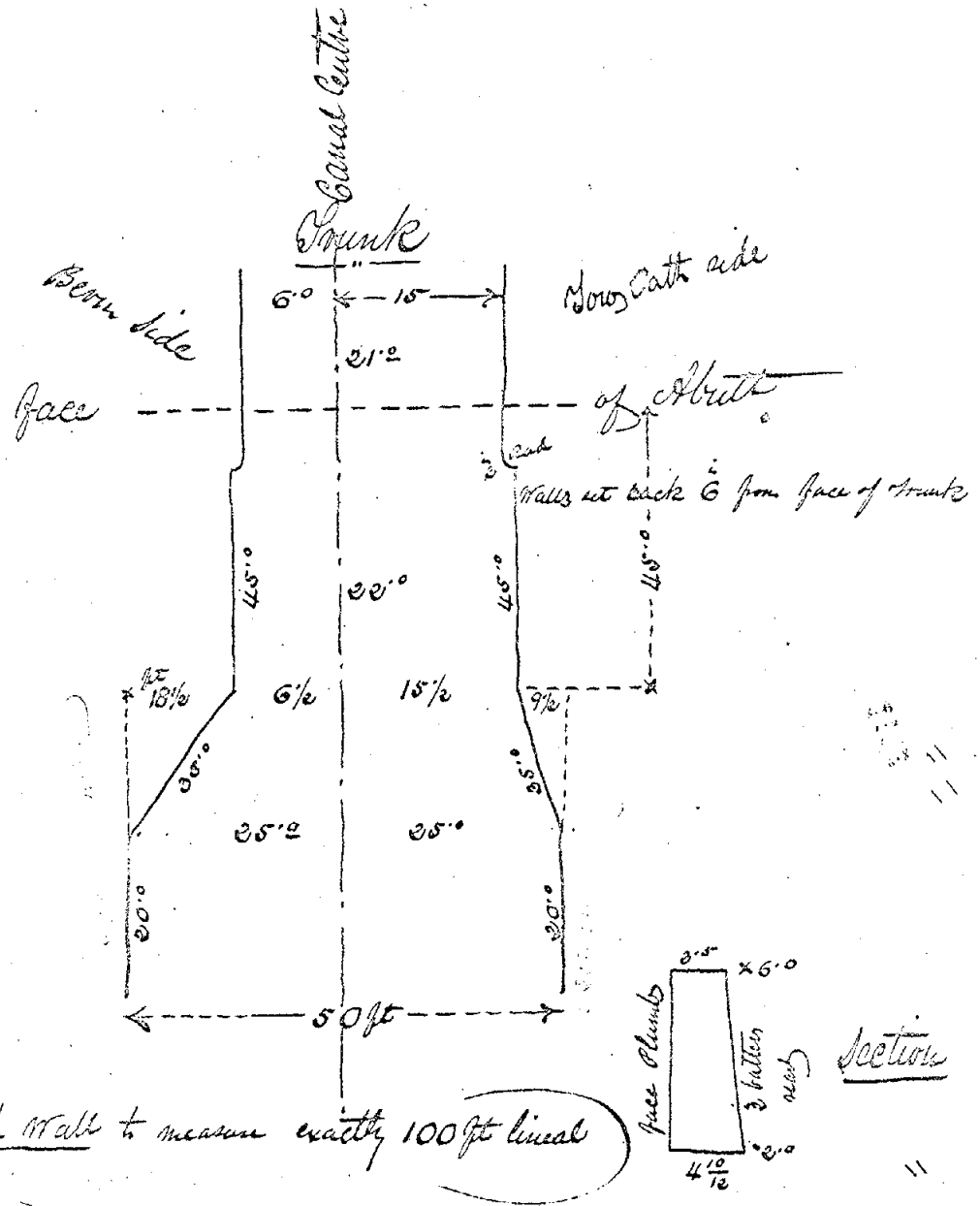
44. Ibid., July 9, 1838 (Ltrs. Recd., Chief Engineer).

45. Ibid., July 16, 1838 (Ltrs. Recd., Chief Engineer).

46. Ibid., July 20, 1838 (Ltrs. Recd., Chief Engineer).

Entrance Walls of Aqueducts

No 687.—



Each Wall to measure exactly 100 ft lineal

PLATE II

Morris was extremely disappointed with the way work was progressing at and near Aqueduct No. 7. In view of the increase in wages and shortage of hands, Morris feared that the canal from Dam No. 5 to the Cacapon would "not be put in navigable order until very late this fall or indeed not before next spring."[47]

Meanwhile, Fisk at the end of April had written the Board that John Uhler, one of the contractors for the iron railing at Aqueduct No. 5, had offered to erect railings on Aqueducts Nos. 6 and 7 at prices somewhat higher than heretofore paid at Aqueducts Nos. 4 and 5. This increase Uhler attributed to the current high price of iron.

Fisk recommended that the Board authorize a contract be signed with Uhler at a price not to exceed what "a fair addition to prices heretofore paid caused by a difference in the cost of iron would make."[48]

Fisk on May 10 had reported to the Board the good news that Story "with great energy has now very nearly completed Lock No. 51." Not only was the work well done, but Story had pushed it forward with more than ordinary vigor.[49]

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47. Ibid.

48. Fisk to Board of Directors, April 30, 1838 (Ltrs. Recd., C & O Canal Co.).

49. Fisk to Board of Directors, May 10, 1838 (Ltrs. Recd., C & O Canal Co.).

On June 15 Story proposed to the Board that he complete Section No. 234 from a point "200 feet above the head of Lock No. 51 to the head thereof," and to finish the lower end of Section No. 235 to a point 120 feet above the western abutment of Aqueduct No. 7. The price Story asked was 28 cents per cubic yard for the excavation of earth, gravel, and loose stones of less than a cubic foot in size. He wanted 75 cents per cubic yard for removing rock and slate.[50]

Work on the aqueduct lagged in June, and on July 7 Brown and Small were paid $189.88 for Aqueduct No. 7 and $302.20 for Lock No. 52.[51]

Small on August 27 announced that he was nearly finished with Aqueduct No. 7. About all that remained to be done was at the top of the arch, which he could not accomplish at present, unless the roadway was stopped. As Lock No. 52 had not been completed, it would be impossible for the contractor to start the dry walls at the lower end, because the foundation had not been excavated.

Brown had been asked at this time by Small to apply to the Board of Directors for $5,000 or $6,000 of the retained money to

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50. Story to Board of Directors, June 15, 1838 (Ltrs. Recd., C & O Canal Co.).

51. Abstract of Payment, July 30, 1838.

enable him to pay his creditors.

If there were any further work that could be done toward completing the aqueduct, Fisk was to contact Rhind, as Small planned to be absent from the project for the next several weeks.[52]

Brown accordingly on September 6 notified the Board that circumstances over which he had little control had arisen to delay the early completion of Aqueduct No. 7 and Lock No. 52. If the President had any questions regarding this development, he should contact Chief Engineer Fisk. With the work nearly finished, the contractors' creditors were beginning to pressure them. To enable Brown and Small to pay some of their debts, Brown asked the Board to let them have $6,000 of the percentage retained on the aqueduct and lock. $5,000 would be utilized to repay loans, while the remainder would enable them to complete these two "works of art."[53]

The Board acted promptly. On September 7 the Treasurer was ordered to turn over to Brown $3,000 of the money retained on Aqueduct No. 7.[54]

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52. Small to Fisk, Aug. 27, 1838 (Ltrs. Recd,, Chief Engineer).

53. Brown to Board of Directors, Sept. 6, 1838 (Ltrs. Recd., C & O Canal Co.).

54. Proceedings of the President and Board of Directors, Book E, p. 488.

At the same meeting of the Board, an application from Chief Engineer Fisk was acted upon. He was finally authorized to enter into contract to secure iron railings for Aqueducts Nos. 6 and 7.[55] Uhler at that time had proposed to supply the railings at ten cents per pound; this figure was to include the cost of placing them, with customary prices for lead and drilling.[56]

Apparently, Fisk had reached an agreement with Uhler on his own, because Morris on September 10 forwarded to his superior the final estimates on the railings for the two aqueducts. The contractor, Morris reported, had completed the railings to his "entire satisfaction."[57] (See Appendix B for a sketch of the iron railing placed at Aqueducts Nos. 6 and 7).

On September 7 Fisk notified President Washington that he had been authorized by the Board to make a contract with Story for the completion of Section No. 234. A portion of this section had been left unfinished, because the masonry for Locks Nos. 51 and 52 had not been completed at the time the contractor had received his final estimate. At the same time, he recommended that the

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55. Ibid., 486.

56. Ibid., 489.

57. Morris to Fisk, Sept. 11, 1838 (Ltrs. Recd., C & O Canal Co.).

contract be signed with Uhler for the iron railings at Aqueducts Nos. 6 and 7, upon terms enunciated by the Board.[58]

Morris had visited Aqueduct No. 7 on November 12, and he was disappointed with what he saw. Even "with reasonable diligence," he could not see how Small and his people could be finished before New Year's Day. It was now evident, he complained to Fisk, that it would be impossible to admit water into the canal at Hancock before the end of 1838. By then, cold weather would have gripped the area, and it would be "necessary" to drain the canal from Dam No. 5 to Georgetown.[59]

A week later, Morris wrote Fisk that he could transfer Assistant Engineer Williams from Hancock about February 1, provided "Andrew Small operates with vigor, but should he (Small)progress as usual he will not complete his work before this time next Summer."[60]

Experience had demonstrated that the aqueducts between Dam No. 5 and Georgetown leaked to some extent. Considerable thought was understandably devoted by Chief Engineer Fisk and his subordinates to ways to control this situation. The plan finally settled upon was to seal the aqueducts with cement, starting with Aqueducts Nos. 6 and 7.

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58. Fisk to the President and Board of Directors, Sept. 7, 1838 (Ltrs. Recd., C & O Canal Co.).

59. Morris to Fisk, Nov. 12, 1838 (Ltrs. Recd., Chief Engineer).

60. Morris to Fisk, Nov. 19, 1838 (Ltrs. Recd., Chief Engineer).

Fisk in the spring of 1838 contacted Thomas Coyle in regard to carrying out this project. On May 14 Coyle promised to have an order of "American Cement" shipped to Hancock. He, however, wished to know the quantity needed to seal Aqueducts Nos. 6 and 7.[61] The people in Baltimore with whom Coyle dealt refused to forward any cement until they learned what price they would receive, as they had all the business they could handle. Coyle accordingly priced his cement at 75¢ per bushel, with the Canal Company to pay the freight and cost of "application." One-half this amount was to be paid in cash and the balance in 12 months.[62]

On July 6 Coyle notified Fisk that he planned to be at Aqueduct No. 6 early next week with his cement and kettles. If the Chief Engineer had any additional instructions relative to the sections of the aqueducts to which he was to apply his cement, he was to write him at Frederick.[63]

Project Engineer Morris saw Coyle in mid-July. At their meeting he gave Coyle his instructions. Aqueducts Nos. 6 and 7 were to be covered with cement, the "Spandril Backing 3 deep, the Arch 1 1/2 & the Rubble sides of the parapet up to the bed of the lower course of Ashlar 1 1/2 (mean thickness)." Coyle had

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61. Coyle to Fisk, May 14, 1838 (Ltrs. Recd., Chief Engineer).

62. Ibid., June 11, 1838 (Ltrs. Recd., Chief Engineer).

63. Ibid., July 6, 1838 (Ltrs. Recd., Chief Engineer).

argued, successfully, that the "thicknesses" of the depth proposed would be sufficient to prevent percolation and would begin to harden within 24 hours.

When Coyle had finished the trunks of Aqueducts Nos. 6 and 7 as high as the cut work, the trunks would be "completely enveloped" with a coating of "American Cement."[64]

Coyle by mid-July had unloaded and positioned his 100-gallon kettles at Licking Creek, and his people had started applying cement to Aqueduct No. 6.[65]

On the 20th Fisk advised Morris that he wished the plan carried out that had been proposed for applying "American Cement" to Aqueducts Nos. 6 and 7. Other factors besides a desire to make the trunks watertight had influenced his decision. To a height of one and one-half feet from the bed, the intervals between the stone would be solidly cemented. Above that point, the uncut masonry, remaining exposed, could be plastered over. Care would be taken to insure that the batter of the spandril filling was preserved at both ends, having first made one off-set of three feet.

The rubble, probably slate rock as it was Small's favorite, used to fill the span was to be sealed with "American Cement." Before any cement was poured, Morris was to see that the rubble

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64. Morris to Fisk, July 16, 1838 (Ltrs. Recd., Chief Engineer).

65. Morris to Fisk, July 19, 1838 (Ltrs. Recd., Chief Engineer).

was closely packed, so as to limit the amount of cement required. Details of how this was to be accomplished would be left to Coyle's discretion.[66]

Upon receipt of these instructions, Morris contacted Coyle and directed him "to run your cement among the Rubble stones. . . so as to fill, if practicable, every crevice." When completed, he wanted the grouting to present as near as possible "an entirely solid mass of stone and cement." The cement was to fill all space not occupied by rubble.[67]

Morris on September 14 visited Licking Creek and saw that Coyle would complete his cementing at Aqueduct No. 6 by the middle of the next week. Relaying this information to Fisk, Morris observed, "Further examinations & a comparison of the amount of cement used & space filled" would be needed to satisfy the engineer as to the "solidity of the mass of filling in the aqueduct." In any event, Aqueduct No. 6 would be given a thorough coating, which should suffice to prevent percolation.[68]

The Board of Directors had not yet sanctioned the use of "American Cement" at Aqueducts Nos. 6 and 7, so Fisk would have to be careful. On October 8 he notified the Board that the

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66. Fisk to Morris, July 20, 1838 (Ltrs. Recd., Morris).

67. Morris to Coyle, Aug. 8, 1838 (Ltrs. sent, Morris).

68. Morris to Fisk, Sept. 15, 1838 (Ltrs. Recd., Chief Engineer).

aqueducts below Dam No. 5 were "filled up over the arch, with masonry, to the level of the canal bottom." A problem had now arisen in regard to Aqueducts No. 6 and 7. In accordance with the specifications, the masonry had been "left lower than the bottom of the canal from 2 to 4 feet, for the purpose of enabling us, by a different kind of filling," to make them watertight.

At Aqueduct No. 6, the Company had been filling "the space with small stones grouted full with 'American Cement.'" This work had been going on when the President was last upon the line, and Fisk had explained the operation to him.

Fisk believed that the Company would find the "American Cement" slightly more expensive than the usual masonry filling, but it would be "as good in the place it is used as hydraulic cement."

If the Company used "American Cement" at Aqueduct No. 7, as he advised, he believed that in the construction of Aqueducts Nos. 8-11 that "we should employ hydraulic cement" to within one foot of the canal bottom, and over this place a thin coat of "American Cement."[69]

Again, on October 17 Fisk moved to secure the Board's approval of this project, which he had undertaken on his own initiative. A letter was received at this time by the Board from Fisk, proposing to cover the arches of Aqueducts Nos. 6 and 7 with "American Cement,

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69. Fisk to Board of Directors, Oct. 8, 1838 (Ltrs. Recd., C & O Canal Co.).

and to employ Thomas C. Coyle, the patentee, to execute the work." The Board went along with its chief engineer's suggestion.[70]

Coyle on November 6 asked to be paid for the cement applied to Aqueduct No. 6, as he required money to pay his creditors. In addition, he wished to be given the go ahead to begin work on Aqueduct No. 7.[71]

Six days later, Coyle wrote Fisk that in view of experience gained at Aqueduct No. 6, he would apply cement to Aqueduct No. 7 for 50 cents per barrel, if he were paid $5 per day for superintending the operation. The Company, as heretofore, was to pay the freight and labor, along with the cost of hauling clay from Licking Creek to Tonoloway Creek. With the exception of the charge for transporting the clay, Coyle felt that the entire cost of applying "American Cement" to Aqueduct No. 7 would not total much over one dollar per barrel.[72]

Fisk complained that the proposed price was too high, so Coyle on December 2 wrote that after "mature and exact Examination of the costs Directly and indirectly," he would apply cement to Aqueduct No. 7 at 96 cents per barrel. This price included the freight of the cement from Baltimore to Hancock, the setting up of kettles and

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70. Proceedings of the President & Board of Directors, Book E, 504.

71. Coyle to Fisk, Nov. 6, 1838 (Ltrs. Recd., Chief Engineer).

72. Ibid., Nov. 12, 1838 (Ltrs. Recd., Chief Engineer).

sheds, and the cost of fuel, labor and tools. His only charge over and above the 96 cents per barrel would be for hauling clay from Licking Creek, and his salary of $5 per day for overseeing the project.[73]

Fisk on December 16 wrote Superintendent William Elgin of the 2nd Division, "You will recollect that I was speaking to you about 'American Cement' and the Catoctin Aqueduct." Since it would now be impossible to apply the "American Cement" to Aqueduct No. 7 "as intended," Fisk had notified Coyle that he was to use the cement intended for that project on the Catoctin Aqueduct.[74]

Work on the Hancock level was finally completed on April 1, 1839, and the hands laid off. Within the next several days, Engineer Morris reported, final estimates would be mailed to Fisk for all works on this section, except Aqueduct No. 7 and Lock No. 52 on which Contractors Brown and Small refused to turn in their list of extras. Small had argued that he wished the estimates first. Morris, however, refused to prepare the estimates until

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73. Coyle to Fisk, Dec. 2, 1838 (Ltrs. Recd., Chief Engineer).

74. Fisk to Elgin, Dec. 16, 1838 (Ltrs. Recd., C & O Canal Co.). Trouble had first developed at the Catoctin Aqueduct in April, 1835, when there was a serious breach. Because of the Company's embarrassing financial condition only makeshift repairs were possible, and a wooden trunk was installed. This trunk held until June 19, 1838, when it gave way. Temporary repairs were effected, but as soon as the water was drawn off for the winter, the aqueduct's trunk was rebuilt with Coyle's cement. Elgin to Fisk, June 19, 1838 (Ltrs. Recd., C & O Canal Co.).

he had seen a list of the extra work for which the contractors were demanding payment.[75]

By April 15 water had been admitted into the recently completed levels of the canal between Dams Nos. 5 and 6, with 3 1/2 feet of water in the Hancock level. With water in these levels 136 miles of the Chesapeake and Ohio Canal from Georgetown to the Cacapon were open to navigation.[76]

On the 24th an article appeared in the Washington National Intelligencer, announcing that it had been a "great pleasure" to learn that water had been "admitted into the twenty-seven miles of this Canal lately finished, and that the boats are now navigating that, as well as the older portions of the line."

This signaled the completion of 136 miles of the canal, "leaving but fifty miles to finish, in order to connect the town of Cumberland with the tide-water, by the most perfect canal navigation which the country can boast of."

A great increase in canal trade could be expected, the newspaper forecast, because the recently opened 27 miles connected with the National Road at Hancock, at which point the descending trade could now be transshipped on boats. Already, several vessels laden

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75. Morris to Fisk, April 6, 1839 (Ltrs. Recd., Chief Engineer).

76. Byers to Fisk, April 15, 1839 (Ltrs. Recd., Chief Engineer); Proceedings of the Stockholders, Vol. B, p. 210.

with potatoes, fish, salt, and other merchandise from the District cities had passed up the canal as far as Dam No. 6.

Because of the unseasonably low stage of the Potomac, river navigation between Cumberland and Dam No. 6 was extremely hazardous; so much so that of seven coal boats that had recently left Cumberland only three had reached the canal, the others having stove in their bottoms on rocks. Such an occurrence, the editor observed, should underscore to the people of Maryland just how important it was for them that the last 50 miles of the canal be completed and opened to navigation.[77]

The Board of Directors reported in June, 1839, that water had been in the newly opened sections for almost two months. Since then there had been no interruptions to navigation, although some apprehension had been felt the sinks in the limestone country about Prather's Neck might prove troublesome.

With the exception of three lockhouses, completing the deposit of gravel at Dam No. 6, and "finishing off some comparatively light work," the canal between Dams Nos. 5 and 6 was finished.[78]

The stockholders learned from a report submitted by the Board of Directors on August 5, 1839, that:

> About 200 feet above the head of Lock No. 52 is Aqueduct No. 7 passing over the Big Tonoloway. This

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77. Washington National Intelligencer, April 24, 1839.

78. Eleventh Annual Report . . . (Washington, 1839), 9.

> is a fine specimen of masonry. There is but a single arch, the span of which would be 80 feet, with a rise of 20 feet segment of a circle were it not that the arch on the eastern side of the creek springs from a natural rock abutment, the surface of which is several feet higher than the level of the masonry abutment; thereby cutting off on the lower side of the creek, all that part of the 80 feet span and 20 feet use. Instead, therefore, of a width of 80 feet for the water way of the creek under the canal, the width is reduced to about 56 feet. With one of the berm wings of this aqueduct there is connected a waste weir.[79]

On January 9, 1839, Morris had notified Small that Brown had asked for final estimates on Aqueduct No. 7 and Lock No. 52. To do this, it would be necessary for Small to provide a "statement in detail . . . of all the extra work whatsoever done under R. Brown's or your direction" on these "works of art." The statements for each would have to be separate and cover the period from the beginning of work till December 1, 1838.[80]

It was early May before Small submitted to Morris the necessary data to enable him to draw up final estimates on Aqueduct No. 7. When he mailed the final estimate to Fisk on the 9th, Morris reported, they embraced "every item to which in my opinion the contractor is in justice entitled." Indeed, what had been allowed he considered "extravagantly high."[81] (See Appendix C for the extras claimed by Small and allowed by Morris.)

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79. Proceedings of the Stockholders, Vol. B, 239.

80. Morris to Small, Jan. 9, 1839 (Ltrs. Sent, Morris).

81. Morris to Fisk, May 9, 1839 (Ltrs. Recd., Chief Engineer).

Brown, when he saw that Morris had recommended against the payment of certain claims for extra work, boiled. He complained to Fisk, and the Chief Engineer promised to check into the matter on his next trip to Hancock.

Not hearing anything further from Fisk, Brown on June 26 reminded him of their recent discussions. "Would you," he wrote, "have the goodness" to review the subject. To facilitate the review Small had been directed to remain at Hancock, so he would be available "to prove that the extra work had been done." Brown trusted, however, that this would be unecessary, because Fisk had "undoubtedly" acquainted himself with the situation and would do us "ample justice."[82]

Not getting the desired satisfaction from Fisk, Brown on July 9 addressed a letter to the Board of Directors. He complained that he had been very much dissatisfied by the final estimates for Aqueduct No. 7. Much extra work had been required by Morris, which had not been included in the final estimate. Brown called the Company's attention to a statement of extras in Fisk's hands. He trusted they could be "settled on just principles with as little delay as possible," because his creditors had been heard to say that he was being unfaithful to his promise to pay them upon the completion of Aqueduct No. 7.[83]

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82. Brown to Fisk, June 26, 1839 (Ltrs. Recd., Chief Engineer).

83. Brown to President & Board of Directors, July 9, 1839 (Ltrs. Recd., Chief Engineer).

On July 15 Secretary Ingle forwarded to President Michael Sprigg the correspondence from Brown regarding final estimates for Aqueduct No. 7 and Lock No. 52. As he studied the documents, Sprigg was to keep in mind that the Company reserved the rights secured to it under its supplementary contracts made with Brown.[84]

The letter to Sprigg failed to accomplish its purpose, so Brown made a personal visit to the Company's Office.[85] Secretary Ingle told him he would have to discuss his problem with Fisk. Consequently, on August 6 Brown wrote Fisk that he had "flattered" himself that the final estimates for Aqueduct No. 7 and Lock No. 52 would receive prompt attention. As the weeks passed and he heard nothing, he had begun to fret. If possible, Brown hoped, Fisk would have the "goodness to give it your attention a few moments if you have not done it already . . . ."[86]

Fisk held his ground in face of the pressure exerted by Brown. In fact, he scaled down from $952.12 1/2 to $451.17 1/2 the sum the contractors were to be paid for extras. (See Appendix C.)

On November 25 Brown and Small were paid $274.00 as their final payment, and the account for the construction of Aqueduct No. 7 was

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84. Ingle to Sprigg, July 15, 1839 (Ltrs. Recd., C & O Canal Co.).

85. Ingle to Fisk, Aug. 1, 1839 (Ltrs. Recd., C & O Canal Co.).

86. Brown to Fisk, Aug. 6, 1839 (Ltrs. Recd., C & O Canal Co.).

closed. All told, the Company had paid out $43,767.87 in 52 installments to the contractors in securing the completion of Aqueduct No. 7.[87]

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87. Ledger Book A, C & O Canal Co.

HISTORIC STRUCTURES REPORT, PART II, TONOLOWAY AQUEDUCT

Chapter II

THE AQUEDUCT FROM 1843-1950

Heavy rains in April and again in August, 1843, sent the Potomac surging to heights unheard of in nearly 40 years and caused considerable damage to the canal. In August a storm front swept across the region north of the Potomac. A tremendous downpour caused the Tonoloway and Monocacy to boom. As these streams rushed toward the Potomac, they swept up debris. Where they passed under the aqueducts, the Tonoloway and Monocacy were said to be at a stage higher than anyone could recall. Drift choked the area beneath the arch, and Aqueduct No. 7 became a dam. As the Tonoloway rushed down to meet the Potomac, a pond was created behind the aqueduct. Soon water was as high as the berm bank, and as the torrent rushed over the dike, it breached the canal near Lock No. 51, thus reducing pressure on the aqueduct. Above the aqueduct, the bridge on the National Road and Bowles' Mill were swept away, adding to the debris carried downstream on the flood crest. This flood compelled a suspension of navigation on the canal from August 20 to September 14.[1]

On August 26 George Stone, who superintended the canal's 3rd Division reported, "we shall have all damage repaired" and the water back in the canal by Wednesday next. Stone's crew

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1. Sixteenth Annual Report . . . (Washington, 1844), 40; Stone to Fisk, Aug. 26, and Oct. 3 and 10, 1843, and Stone to Board of Directors, Sept. 9, 1843 (Ltrs. Recd., C & O Canal Co.).

consisted of 80 men and 12 carts. No damage was done to Aqueduct No. 7, but the towpath was breached at several nearby points.[2]

It having been determined by the Board to use the same type of railings on the aqueducts on the "50-mile section" as those on Aqueduct No. 7, Chief Engineer Fisk asked Superintendent Stone for a description. Stone accordingly on December 19, 1848, wrote Fisk that the number of rails between each post on Aqueduct No. 7 was 13.[3]

Assistant Engineer Byers on May 16, 1849, forwarded to Chief Engineer Fisk a sketch of the railings on Aqueducts No. 8 and 9. When he studied the railings, he found there was considerable variation in the scrolls and the length of the rods along the rail. The round rods were 8 inches from centre to centre, with some variation, while the scrolls were "quite irregular." (A drawing titled, "Sketch of the ornamental parts of the iron railing Aqueduct No. 7," accompanies this report.)[4]

Superintendent Overton Lowe on October 6, 1851, notified Fisk that he had succeeded in getting out all the timber necessary for Aqueduct No. 6 to be delivered in ten days at

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2. Stone to Fisk, Aug. 26, 1843 (Ltrs. Recd., C & O Canal Co.).

3. Stone to Fisk, Dec. 19, 1848 (Ltrs. Recd., C & O Canal Co.).

4. Byers to Fisk, May 16, 1849 (Ltrs. Recd., C & O Canal Co.).

$1.31 per hundred. At the same time, he had learned that Baner Graves had a large quantity of hewn timber well adapted to use at Aqueduct No. 7. This timber could be purchased for $1.31 per hundred. Tie bolts for the work at the aqueducts could be fashioned at Stone's shop.[5]

Chief Engineer Fisk on February 12, 1852, asked Lowe to report conditions at Aqueduct No. 7. Before the water was readmitted to the Hancock level, Fisk wanted the trunk of the aqueduct measured at 10-foot intervals with "great accuracy."[6] After completing his assignment, Lowe on the 17th informed Fisk that he had been surprised to discern that the west end of the aqueduct was nearly five inches wider than the east end. Had it been planned and built this way? he inquired.[7]

T. L. Patterson, Engineer and General Superintendent, reported on June 1, 1853, "The Aqueducts are in good condition and require no repairs."[8]

Division Superintendent William Hassett on March 16, 1865, warned that there was a bad break in Aqueduct No. 7, and unless this was repaired he feared its wall might give way in the same manner as had that of the Conococheague Aqueduct. He was

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5. Lowe to Fisk, Oct. 6, 1851 (Ltrs. Recd., C & O Canal Co.).
6. Fisk to Lowe, Feb. 12, 1852 (Ltrs. Sent, C & O Canal Co.).
7. Lowe to Fisk, Feb. 17, 1852 (Ltrs. Recd., C & O Canal Co.).
8. Twenty-Fifth Annual Report . . . (Washington, 1853), 9.

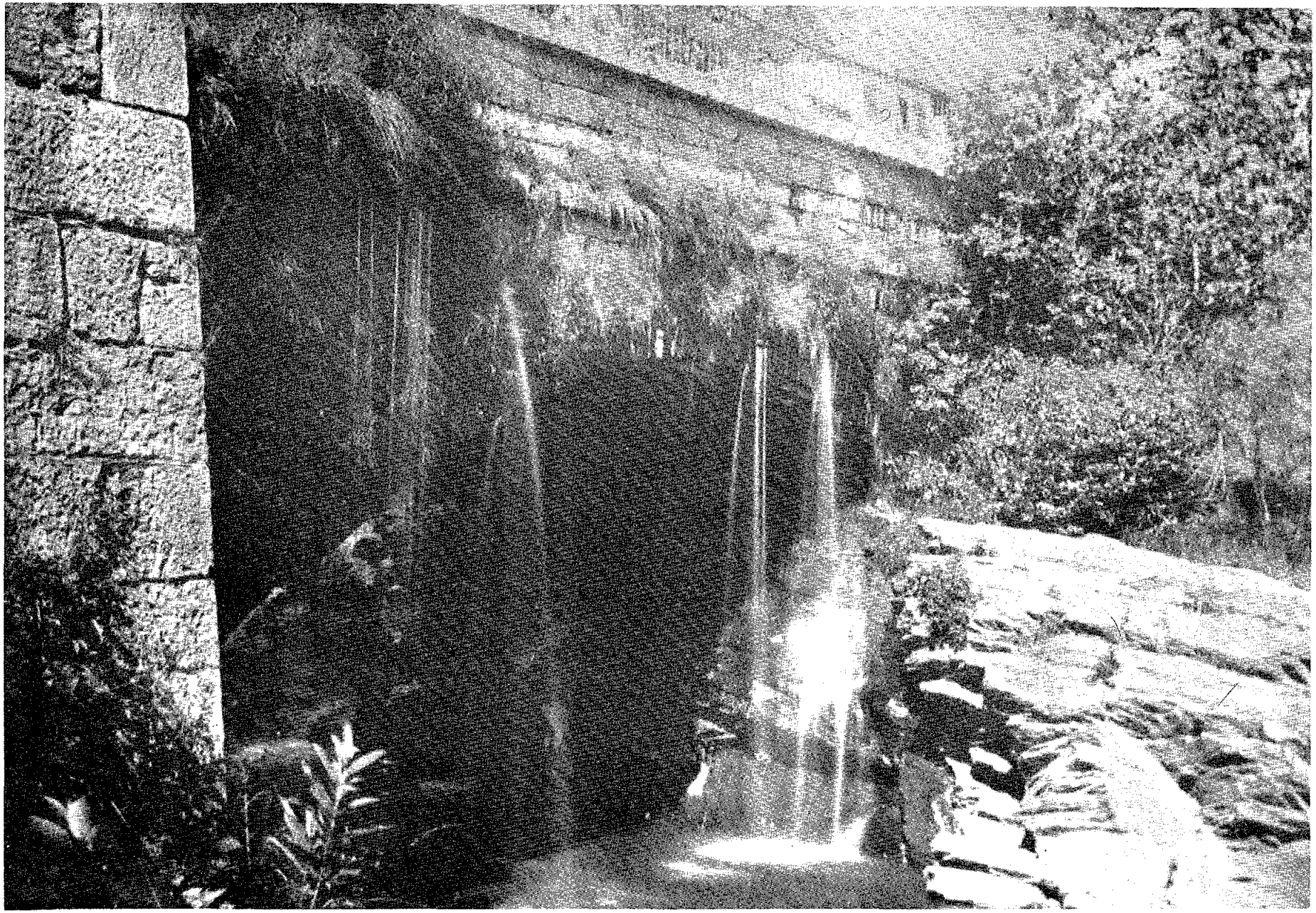

PLATE III
Photograph made in 1863 of the towpath side of the Tonoloway Aqueduct from files, C & O Canal NM.

accordingly authorized to close the break.[9]

Unlike several of the Company's "works of art," the Tonoloway Aqueduct suffered no damage during the Civil War. According to the Board of Directors in June, 1866, the masonry of the aqueducts, culverts, and locks is "both substantial and in good repair, the only exception was Aqueduct No. 5 spanning the Conococheague River." During the late conflict that structure had been "wantonly and most seriously injured" by the Confederates.[10]

In November, 1869, the Board of Directors traveled the entire line of the canal from Georgetown to Cumberland, and in the following June they reported to the stockholders:

> The masonry, we regret to say was mostly in very bad condition, caused principally by keeping the water in the canal, late in the season, after the freezing weather had commenced. The ice thus forming in the cracks of the works, expands and breaks the bonds of the cement, leaving the structure more like a pile of loose stone than a duct for conveying water; besides, when the ice is permitted to form on the surface of the water in the aqueducts, the expansion pushes out the wall on the berm side, which is only five feet in thickness, and therefore more liable to yield than the towing path side, which is from seven to eight feet thick.[11]

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9. Hassett to Board of Directors, March 16, 1865 (Ltrs. Recd., C & O Canal Co.). On March 5 the berm wall of the Conococheague Aqueduct had given way and fell into the stream. There had been a crack in the structure for the last six years, and the blasting by the Rebels and the hard freezes of the past winter had so weakened the structure that it fell. Masters to Ringgold, March 6, 1865 (Ltrs. Recd., C & O Canal Co.).

10. Thirty-Eighth Annual Report . . . (Washington, 1866), 7-8.

11. Forty-Second Annual Report . . .(Annapolis, 1870), 3-4.

Chief Engineer William R. Hutton warned the Board on June 1, 1870, that the masonry of the Tonoloway Aqueduct was in a "bad state, having been built of inferior stone" from Hart's quarry which had "now cracked in every direction, and in places has come to pieces, and fallen out." The walls of the aqueduct had bulged, and to keep them from tumbling iron rods, entirely through the work, had been employed. Unless "extensive and heavy repairs" were undertaken within a few years, the structure might collapse. As a temporary measure, Hutton recommended "coating and repairing with cement or artificial stone" the arch. If this did not work, the arch would have to be rebuilt.[12]

On May 31, 1873, Engineer Patterson reported that most of "the aqueducts have been leaking more or less for years past; the consequence of which, owing to freezing of water in the interior of the walls, has been a greater or less injury to their berm parapets and spandrils." At two of the eleven aqueducts, Senaca and Tonoloway, this damage had reached the point, where it would be "necessary to take down and rebuild a portion of the berm side." But for the extreme cold weather, this work would have been undertaken during the winter of 1872-1873 by putting in a trunk at Aqueduct No. 7, which would make it feasible to take down and rebuild as much of the berm parapet spandrils and arch, as necessary, without

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12. Ibid., 4.

interfering with navigation. This could be done at the Tonoloway Aqueduct, because of the width of the waterway, but such an undertaking was not feasible at the narrower Seneca Aqueduct, where the work would have to be done during the winter's suspension of navigation.

Patterson felt confident that the iron reinforcing rods would hold the aqueducts together, but to be ready for an emergency he had timbers and other materials necessary for the construction of wooden trunks stockpiled at points convenient to the two aqueducts.[13]

During the winter of 1873-1874 the berm wall of the Tonoloway Aqueduct was dismantled and a wooden trunk put in. Because of the time factor, the workers were unable to rebuild the berm wall before the canal was reopened to navigation in the spring of 1874. Plans were drafted to do this work the next winter.[14]

Chief Engineer Hutton, however, decided not to wait for winter. On May 9 he wrote President Arthur P. Gorman that to reconstruct the berm parapet of the Tonoloway Aqueduct, 150 yards of stone would be required. Of this quantity, two 85-foot courses were required with wide beds and good joints of convenient height. The rest was to be good quality stone, suitable for good rubble or broken

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13. Forty-Fifth Annual Report . . . (Annapolis, 1874), 28-29.

14. Forty-Sixth Annual Report . . . (Annapolis, 1875), 11.

ranged Ashlar.[15]

Nine days later, Hutton informed Gorman that he had been mistaken: three courses of stone 96 feet long, instead of two 85 feet long were needed.[16]

On the 24th Hutton asked for the assignment of a stone mason to the Tonoloway project for several days. The services of a mason were required for cutting Ashlar.[17]

The berm wall was soon rebuilt, and a number of years passed before any additional problems occurred at the Tonoloway Aqueduct. Fourteen years later on January 1, 1886, Superintendent E. S. Mulvany informed the Board that on his division (the 2nd) the "masonry work at many places is in need of repair." Most of the aqueducts were badly cracked, with the mortar washed out of the joints, which caused considerable leakage. This leakage would have to be attended to during the suspension of navigation.[18]

Mulvany reported on December 24, 1887, that all the aqueducts on his division leaked considerably, while some of the walls were

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15. Hutton to Gorman, May 9, 1874 (Ltrs. Recd., C & O Canal Co.).

16. Ibid., May 18, 1874 (Ltrs. Recd., C & O Canal Co.).

17. Ibid., May 24, 1874 (Ltrs. Recd., C & O Canal Co.).

18. Fifth-Eighth Annual Report . . . (Annapolis, 1886), 25. The engineer in charge, L. G. Stanhope, after the work was completed notified President Gorman, the "aqueduct at Hancock is pretty tight." Stanhope to Gorman, March 9 (Ltrs. Recd., C&O Canal Co.).

very "much bulged and cracked." In fact, the berm masonry parapet walls of two of them (Tonoloway and Sideling Hall) had collapsed several years before and had been replaced by wooden trunks, which had "answered a good purpose so far." These wooden trunks, however, would have to be "overhauled and repaired" in the near future.[19]

In 1950 an engineer who visited the site reported that Aqueduct No. 7 was "a single-span arch," with one end of the span framing into a rock bluff. Both spandrils had fallen, while the voussoir stones in the barrel of the arch showed "considerable disintegration." A complete reconstruction of the structure was recommended.[20]

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19. Sixtieth Annual Report . . . (Annapolis, 1888), 30.

20. Chesapeake and Ohio Canal Report, 81st Congress, 2nd Session, House Document No. 687 (Washington, 1950), 70.

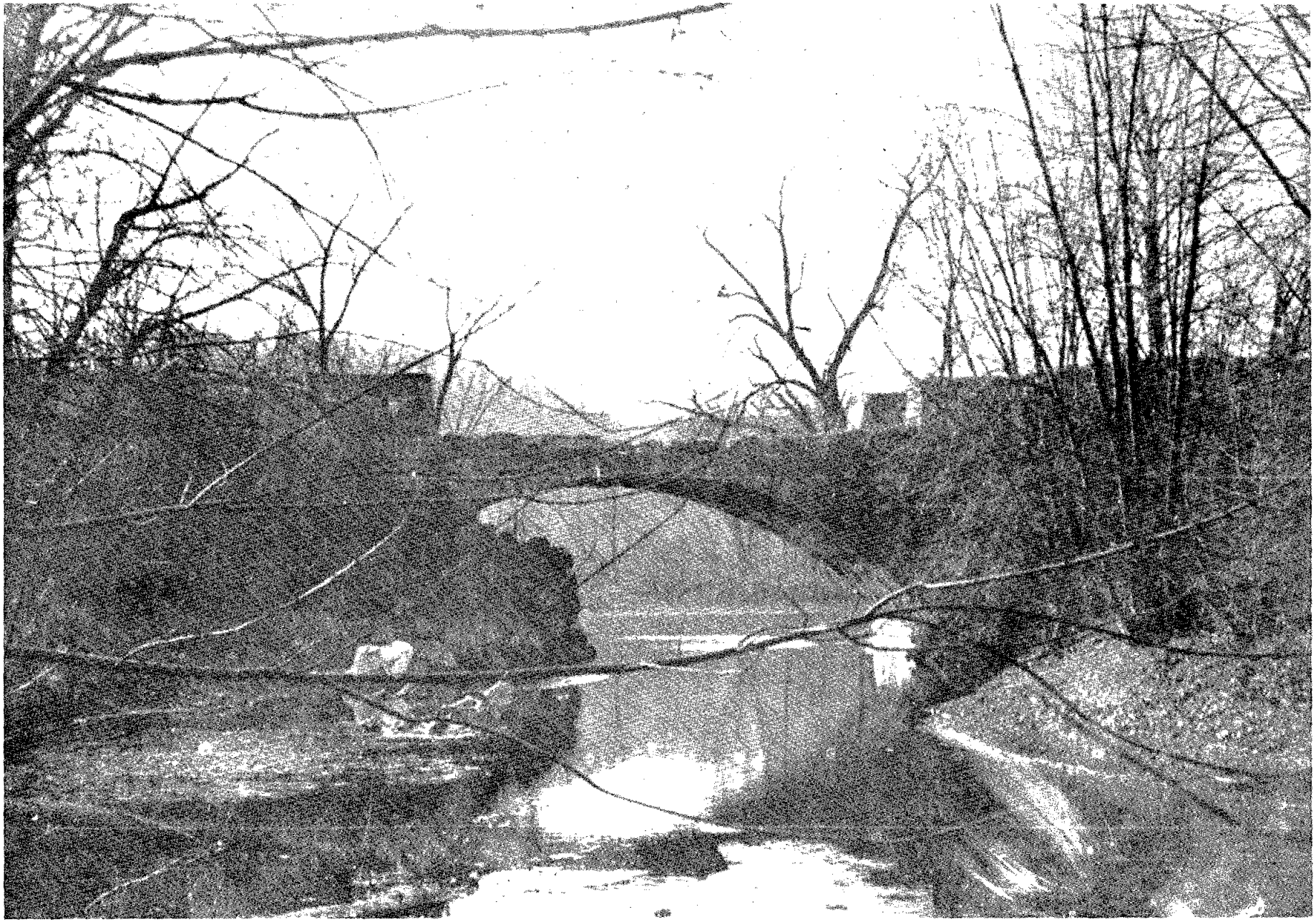


PLATE IV
Photograph made in 1964 of the Berm side of the Tonoloway Aqueduct, from files, C & O Canal NM.

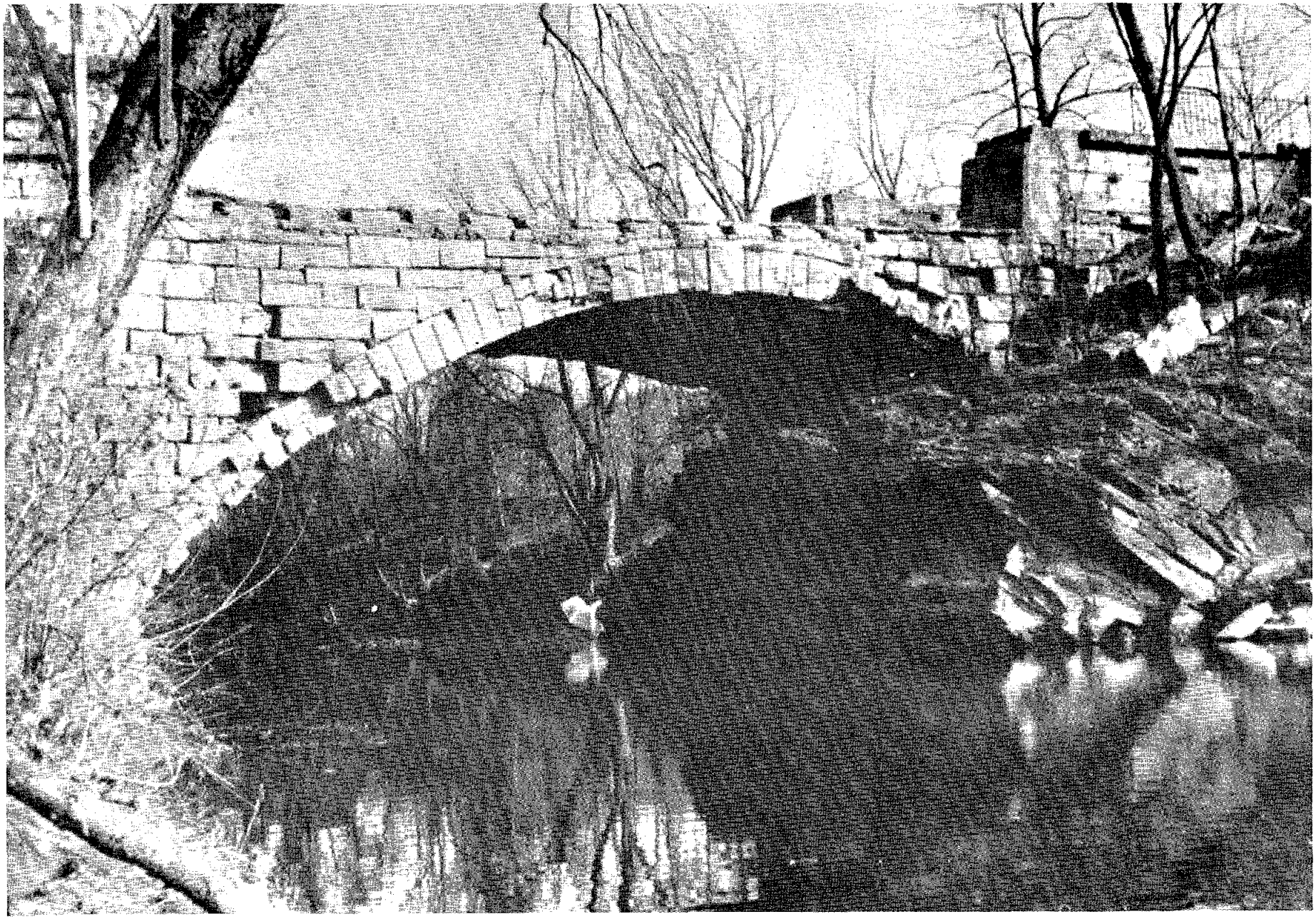


PLATE V
Photograph made in 1964 of the Towpath Side of the Tonoloway Aqueduct, from file, C & O Canal NM.

APPENDIX A

Payments made by the Company for the Construction of AQUEDUCT NO. 7

Robert Brown

Debits				Credits		
	1835			1835		
Oct. 1	To Geo. Bender		$1,120.00	Oct. 1	For Const.	$1,400.00
Nov. 4	To Geo. Bender		1,063.20	Nov. 1	For Const.	1,658.75
	To Cement	$1,055.16	263.80	Dec. 1	For Const.	2,832.50
Dec. 7	To Geo. Bender		2,163.50		1836	
	To Cement	410.00	102.50	Feb. 1	For Const.	1,574.00
	1836			Mar. 1	For Const.	81.87
Feb. 3	To Geo. Bender		1,259.20	Apr. 1	For Const.	479.33
Mar. 12	To Geo. Bender		65.50	May 1	For Const.	742.77
Apr. 2	To Geo. Bender		383.47	June 1	For Const.	2,277.78
May 4	To Geo. Bender		554.22			
June 6	To Geo. Bender		1,822.23			
July 7	To Geo. Bender		747.66	July 1	For Const.	1,049.89
	To Cement	529.00	132.25	Aug. 1	For Const.	1,174.25
Aug. 4	To Geo Bender		880.90	Sept. 1	For Const.	1,543.75
	To Cement	234.00	58.50	Oct. 1	For Const.	1,268.75
Sept. 9	To Cement	482.00	120.50	Nov. 1	For Const.	1,528.78
	To Geo. Bender		1,114.50	Dec. 1	For Const.	616.67
Oct. 11	To Geo. Bender		1,015.00			
	To Geo. Bender Part of est.		804.18			

Aqueduct No. 7

	Debits		Robert Brown	Credits		
Nov. 10	To Geo. Bender		1,211.27			
	To Cement	1.47	11.75			
Dec. 13	To Geo. Bender		481.09			
Dec. 29	To Geo. Bender Part of est.		1,000.00			
	To Cement	582.44	12.50			
	1837				1837	
Jan. 11	To Geo. Bender		242.20	Jan. 1	For Const.	302.75
Mar. 13	To Geo. Bender		134.35	Mar. 1	For Const.	627.38
Apr. 6	To Geo. Bender		289.18	Apr. 1	For Const.	435.00
	To Geo. Bender (Cement)	366.00	91.50	May 1	For Const.	2,087.50
						$21,681.72
May 1	To Geo. Bender		1,648.31			
	To Cement	713.00	178.75			
			$18,971.21			
June 12	To Geo. Bender		1,181.44	June 1	For Const.	$1,570.50
	To Cement	771.36	192.75	July 1	For Const.	1,353.25
July 12	To Geo. Bender		1,090.35	Aug. 1	For Const.	4,538.00
Aug. 10	To Geo. Bender		3,618.63	Sept. 1	For Const.	2,286.00
	To Cement	1,773.09	443.25	Oct. 1	For Const.	1,864.25
Sept. 12	To Geo. Bender		1,680.83	Nov. 1	For Const.	2,252.25
	To Cement	1,277.48	319.42	Dec. 1	For Const.	3,689.75
Oct. 17	To Geo. Bender		1,430.72			
	To Cement	802.00	200.00			

Aqueduct No. 7

Debits			Robert Brown	Credits		
Oct. 17	To Geo. Bender		1,430.72			
	To Cement	802.00	200.00			
Nov. 14	To Geo. Bender		1,709.88			
	To Cement	1,050.22	262.59			
Dec. 18	To Geo. Bender		3,138.88			
	To Cement	358.47	89.65			
	1838			1838		
Mar. 5	To Geo. Bender		824.69	Feb. 1	For Const.	$ 942.50
May 11	To Geo. Bender		627.21	May 1	For Const.	778.00
	To Cement	214.03	53.51	June 1	For Const.	832.50
June 12	To T. Fillebrown		653.44	July 1	For Const.	217.00
	To Cement	300.00	75.00			
July 25	To T. Fillebrown		189.88			
Sept. 8	To M. Sprigg		3,000.00			
	1839			1839		
Sept. 14	To M. Sprigg		11.00	Sept. 1	For Const.	1,765.15
Sept. 18	To M. Sprigg		3,740.00			$43,767.87
Nov. 25	To M. Sprigg		274.01			
			$43,767.87			

Entrance Wall to Aqueduct No. 7

Debits			Andrew Small	Credits		
	1838			1838		
June 1	To T. Fillebrown		500.00	Mar. 1	For Const.	625.00
	1839			1839		
				May 31,	Debit to Const	125.00
						$500.00

Entrance Wall to Aqueduct No. 7

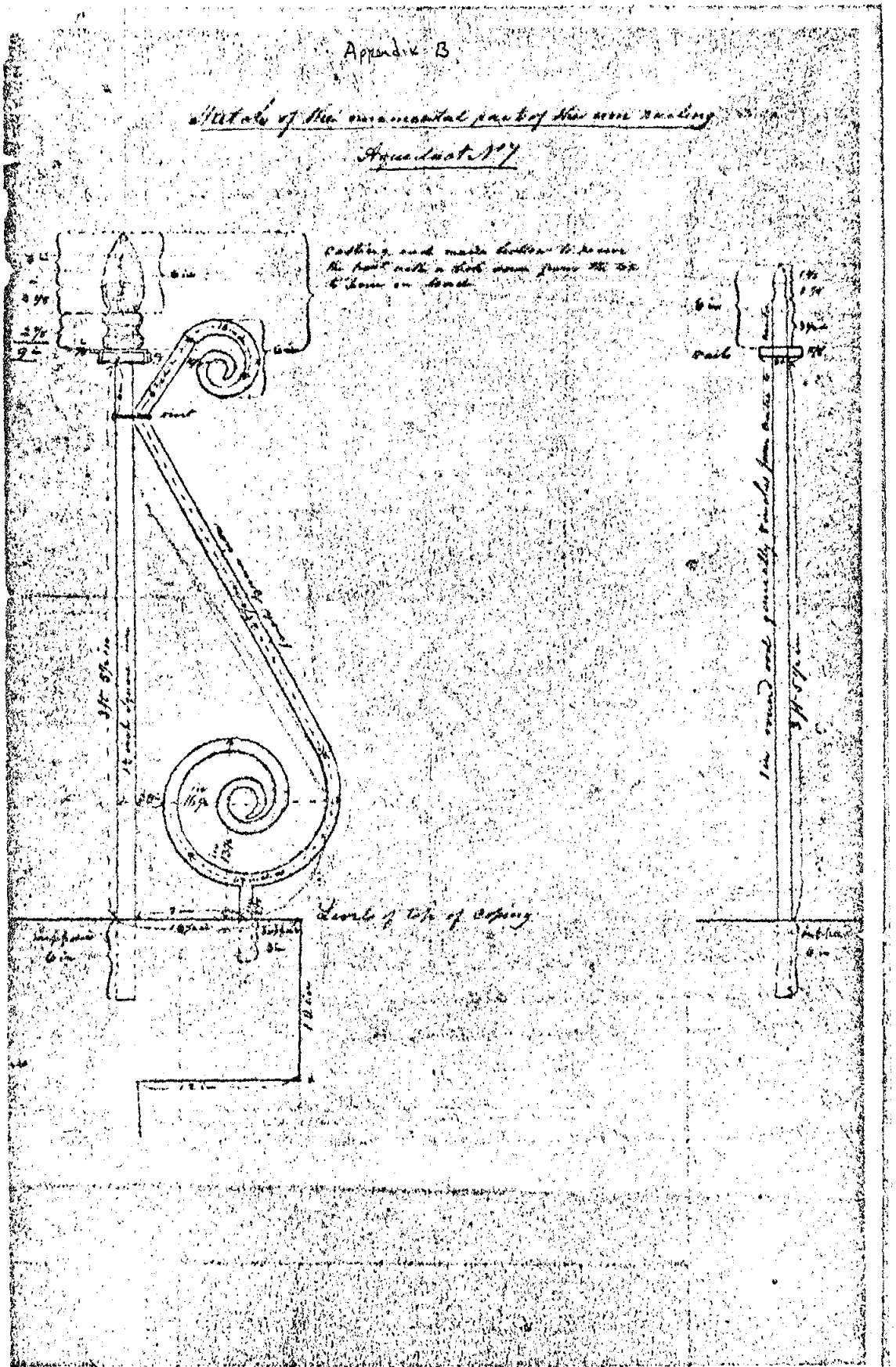
William Storey

Debits				Credits		
1838				1838		
July 10	To T. Fillebrown		$ 240.00	July 1	For Const.	$ 300.00
Aug. 11	To M. Sprigg		240.00	Aug. 1	For Const.	300.00
Sept. 13	To M. Sprigg		486.95	Sept. 1	For Const.	902.00
	To Cement	938.40	234.65	Oct. 1	For Const.	1,290.00
Oct. 12	To M. Sprigg		904.34	Nov. 1	For Const.	1,188.00
	To Cement	510.44	127.66			
Nov. 14	To M. Sprigg		797.31			
	To Cement	612.26	153.09			
	1839			1839		
Feb. 13	To M. Sprigg		971.22	Feb. 3	For Const.	175.23
			$4,155.23			$4,155.23

Appendix B

Sketch of the ornamental parapet over the arch

Aqueduct No 7



APPENDIX C

Note of Extras on Aqueduct No. 7, C & O Canal

By Mr. Morris' orders.

(1)	To cutting all the joints of the Rubble stones that were used on the top of the Ring stones round all the arch-length 150 feet at 50¢ per foot.....$ 75.	Not allowable (in my opinion) because the Rubble work could not be fitted to the arch without such a process. E.M.
(2)	To dressing over all the face of the Ashlar a second time after being received & passed by the inspector, for which there was paid 18-3/4 ¢ per foot (this does not include repairing joints) 1,650 feet.....$309.37 1/2	Not allowable (in my opinion) because the contractor by his article is bound to furnish all the materials which may be necessary or proper (for the work) according to the specifications of such quantity as an Engineer of the Canal Co. may approve ....
(3)	To 103 perch extra Masonry at outside of waste weir for which a new crane was erected, and only $8 been allowed while it cost $10, leaving $2 per perch due.....$206	$8 per perch is (in my opinion) a sufficient price for this work.
(4)	To scabbled pavement betwixt jambs in waste weir, 7 perch 5 feet at $10 per perch.....$ 72.	I value this at $8 per perch that being (in my opinion) an ample price.
(5)	To extra scabbling round jambs of waste weir, 408 feet at 18-3/4 ¢.....$76.	These jambs, &c., I value by the perch at $8.
(6)	To cutting the Recesses for receiving the wooden frames at the waste weir and checking the coping for it....$ 48.	$30 allowable for this ...that being...an ample price, considering that $19.87 1/2 per perch is

		also paid for this work as cut stone masonry.
(7)	To 171 days of Laborers trimming, &c. for lower Foundation wall of waste wier at $1.25.....$213.75.	I allow this $213.75 though it puts the Rock foundation up to $3 per cubic yard: $2 being the price I had heretofore fixed as sufficient.
(8)	Mr. Morris also desired all the Rubble Masonry on the aqueduct to be leveled 1/2-inch higher than was necessary & to be cut down for the coping--there is 365 feet, a Stonecutter would cut 20 feet a day, which would be 18 days at $2.50.....$ 45.00	Mr. Morris did order all the Mas. to be first levelled up 1/2 an inch as above the true bed of the coping & then reduced. Because 1st it is difficult to get such an extent of coping truly bedded without such a process, owing to the common inaccuracy of workmanship upon the part of the contractor: 2nd because his assistant, Mr. Williams, had reported to him that at Lock #52 this contractor did not scruple...to make up any defficient stone to the full height of the course by laying such upon mortar beds of 1 inch or more in thickness & then daubing the joint with stone dust to hide it from the eye....
(9)	Mr. Fisk is respectfully reminded of the scabbled work at the base of the skewback of springers that not nearly what it cost has been paid for.	The prices paid for the work alluded to are (in my opinion) more than ought to have been allowed for such work. But on checking with Chief Engineer Fisk, they were set down at $8 & $11 per perch.
(10)	In our calculations for the work, the arch to cost $19.87 1/2 per perch, & the cut stone in parapets at $13--the profits on them to pay for centres, &c.,	This is a matter with which I conceive I have nothing to do.

and as the waste weir takes off

	P	F
Ashlar	6	6
Coping	2	22
Water tabling.	1	11
	10	14

Which will amount to.....$ 72
This sum ought in justice to be allowed in consequence of the alteration in the plans.

On the whole therefore the reasons assigned in the marginal notes I feel myself required by the contract to allow of the extras named above only (3) (4) (5) (6) (7) & (9). Modified as in the margin, and to reject the balance for the reasons stated.

Ellwood Morris
Asst. Eng. C&O Cl.

Memorandum by C. B. Fisk

The above items (Nos. 1 to 10 both inclusive) excluding No. 9 amounted to.....$952.12 1/2

Of these items, there were allowed in the final estimate before it was object to by Mr. Brown (Including nothing for the 5th item).....$154.35

Allowed in Report of Chief Engineer, including 9th item.....$346.60

$451.17 1/2

Cement for Aqueduct No. 7 and Lock 52--C&O Canal

Having conversed with Mr. Morris regarding the transportation of the cement, I omitted to charge what was paid at the mill, viz.

About one cent per bushel for loading.

I found that the costs will be as follows:

From McCoy's Ferry per bushel	$ .25
From Leopard's Mill per bushel	$ .25
From Hook's or Shaffer's Mill per bushel	$ .07
To 180 bushels from Williamsport per bushel	.40

These prices arise from the wagons returning frequently empty, or partly so.

Mr. Fisk will observe by the memorandum or Bill No. I made by me at the time, what the understanding between Mr. Small and myself on the subject of cement transportation amounted to:

This matter I shall leave open for Mr. Fisk to decide believing that the account, Bill No. I, & Mr. Fisk's local knowledge of the facts will enable him to do so without further action on my part.

(signed)
Ellwood Morris

According to Assistant Engineer S. W. Williams the cost of transporting cement to be used in Aqueduct No. 7 and Lock No. 52 from Hook's Mill had been estimated at 6 1/4 cents per bushel, while the cost of hauling cement from McCoy's Ferry had been placed at 23¢ per bushel.